

1 What is claimed is:

2 1. A biodegradable wellbore fluid comprising:

3 an oleaginous phase substantially composed of a linear paraffin having 11-18
4 carbon atoms,

5 a non-oleaginous phase containing a salt of a biodegradable anion, and

6 an emulsifying agent in a concentration capable of forming an invert emulsion
7 suitable for use as a drilling fluid.

8 2. The fluid of claim 1 wherein the oleaginous phase comprises from about
9 30 to 99% by volume of the fluid and wherein the non-oleaginous phase comprises from
10 about 1% to about 70% by volume of the fluid.

11 3. The fluid of claim 2 wherein the non-oleaginous phase is substantially free
12 of halogen ions.

13 4. The fluid of claim 2 wherein the non-oleaginous phase is selected from,
14 fresh water, a brine containing organic or inorganic dissolved salts, a liquid containing
15 water-miscible organic compounds, and combinations thereof.

16 5. The fluid of claim 1 wherein the emulsifying agent is eurisic diglyceride.

17 6. The fluid of claim 1 further comprising a weighting agent selected from
18 the group consisting of calcium carbonate, hematite, ilmenite, barite, mullite, gallena,
19 manganese oxides, iron oxides and combinations thereof.

20 7. The fluid of claim 1 further comprising a fluid-loss reducing agent.

21 8. The fluid of claim 1 further comprising a viscosifying agent.

22 9. The fluid of claim 8 wherein the viscosifying agent is an organophilic clay.

23 10. A method of producing a biodegradable wellbore fluid, the method
24 comprising:

25 blending an oleaginous phase substantially composed of a linear paraffin having
26 11-18 carbon atoms, a non-oleaginous phase containing a salt of a biodegradable anion
27 and substantially free of halogen ions, and an emulsifying agent in a concentration
28 capable of forming an invert emulsion suitable for use as a drilling fluid, in amounts
29 sufficient so as to produce a biodegradable wellbore fluid.

30 11. A method of drilling a wellbore comprising,

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1 attaching a drilling bit to a length of drill pipe,
2 rotating the drilling bit so as to form the wellbore,
3 circulating a drilling fluid through the drill pipe and the wellbore so as to remove
4 the cuttings from around the drilling bit and out of the wellbore, and
5 separating the cuttings from the drilling fluid,
6 wherein the drilling fluid is a biodegradable wellbore fluid including an
7 oleaginous phase substantially composed of a linear paraffin having 11-18 carbon atoms,
8 a non-oleaginous phase contains a salt of a biodegradable anion, and an emulsifying agent
9 in a concentration capable of forming an invert emulsion suitable for use as a drilling
10 fluid.

11 12. The method of claim 11, wherein the oleaginous phase is substantially free
12 of halogen ion.

13 13. The method of claim 11 further comprising bioremediating the cuttings
14 after separating the cuttings from the drilling fluid.

15 14. The method of claim 13 wherein the bioremediating of the cuttings is
16 carried out using a method selected from: landfarming, reacting in a bioreactor,
17 conventional composting, vermiculture composting and combinations thereof.

18 15. A method of bioremediating wellbore cuttings comprising:
19 drilling a subterranean well using a drilling fluid including an oleaginous phase
20 substantially composed of a linear paraffin having 11-18 carbon atoms, a non-oleaginous
21 phase contains a salt of a biodegradable anion, and an emulsifying agent in a
22 concentration capable of forming an invert emulsion suitable for use as a drilling fluid;

23 removing the cuttings from the well;

24 transporting the cuttings to a remediation site;

25 blending the cuttings with nutrients to create a treatment feed, and

26 bioremediating said treatment feed so as to substantially bioremediate the cutting.

27 16. The method of claim 15, wherein the non-oleaginous phase is substantially
28 free of halogen ions.

29 17. The method of claim 15 wherein the treatment feed is formed into a slurry
30 and the slurry is placed in a bioreactor and bacteria perform the bio-remediation.

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18. The method of claim 15 wherein the treatment feed is pretreated in a compost vessel prior to being formed into a slurry.
19. A soil amendment comprising:
drill cuttings from a wellbore, wherein said wellbore was drilled using a drilling fluid including an oleaginous phase substantially composed of a linear paraffin having 11-18 carbon atoms, a non-oleaginous phase containing the salt of a biodegradable anion, and an emulsifying agent in a concentration capable of forming an invert emulsion suitable for use as a drilling fluid, and a bulking agent.
20. The soil amendment of claim 19, wherein the non-oleaginous phase is substantially free of halogen ion.
21. The soil amendment of claim 20 wherein the drill cuttings are formed into a drill cuttings slurry and the drill cuttings slurry is placed in a bioreactor and bacteria perform the bio-remediation.
22. The method of claim 20 wherein the non-oleaginous phase is substantially free of halide ions.
23. The soil amendment of claim 20 wherein the bulking agent is selected from sawdust, wood shavings, rice hulls, canola husks, shredded newsprint/paper; shredded coconut hulls, cotton seed hulls, and mixtures of these
24. The soil amendment of claim 20 wherein the emulsifying agent is eurisic diglyceride.
25. A method comprising biodegrading by vermicomposting drilling cuttings coated with a drilling fluid, wherein the drilling fluid formulation includes a linear paraffin having 11-18 carbon atoms, a non-oleaginous phase, and an emulsifying agent.
26. The method of claim 25 further comprising mixing the drilling cuttings with a compostable waste material so as to provide a compostable balance of nitrogen and carbon content.
27. The method of claim 25 wherein the nitrogen and carbon content have a ratio of about 2:1 to about 100:1.
28. The method of claim 25 wherein the nitrogen and carbon content have a ratio of about 25:1.

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29 The method of claim 25 wherein the vermicomposting is carried out in a
2 bioreactor from a bin vermicomposter, a rotating drum vermicomposter, windrows or
3 combinations of these.

4 30. The method of claim 25 wherein the drilling fluid further includes a
5 weighting agent.

6 31. The method of claim 25 wherein the non-oleaginous fluid is selected from
7 fresh water, sea water, a brine containing organic or inorganic dissolved salts, a liquid
8 containing water-miscible organic compounds, and combinations thereof.

9 32. The method of claim 25 wherein the emulsifying agent is a euristic
10 diglyceride.

11 33. A method for biodegrading drilling cuttings coated with a drilling fluid,
12 the method comprising: exposing the drilling cuttings to a vermicomposting environment
13 for a sufficient period of time to permit the worms to biodegrade the organic components
14 of the drilling fluid.

15 34. The method of claim 33 wherein the drilling fluid is formulated to include
16 a linear paraffin having 11-18 carbon atoms, a non-oleaginous phase, and an emulsifying
17 agent.

18 35. The method of claim 33 further comprising mixing the drilling cuttings
19 with a compostable waste material so as to provide a compostable balance of nitrogen
20 and carbon content.

21 36. The method of claim 33 wherein the nitrogen and carbon content have a
22 ratio of about 2:1 to about 100:1.

23 37. The method of claim 33 wherein the nitrogen and carbon content have a
24 ratio of about 25:1.

25 38. The method of claim 33 wherein the vermicomposting is carried out in a
26 bioreactor selected from a bin vermicomposter, a rotating drum vermicomposter,
27 windrows and combinations of these.

28 39. The method of claim 33 wherein the drilling fluid further includes a
29 weighting agent.

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40. The method of claim 33 wherein the non-oleaginous fluid is selected from fresh water sea water, a brine containing organic or inorganic dissolved salts, a liquid containing water-miscible organic compounds, and combinations thereof.

41. The method of claim 33 wherein the emulsifying agent is a euristic diglyceride.

42. A method of vermicular bio-remediation of oil contaminated solids, the method comprising providing the oil contaminated solids to a vermicular bioreactor, and allowing the worms within the vermicular bioreactor to biodegrade the oil contaminated solids.

43. The method of claim 42 wherein the drilling fluid is formulated to include a linear paraffin having 11-18 carbon atoms, a non-oleaginous phase, and an emulsifying agent.

44. The method of claim 42 further comprising mixing the drilling cuttings with a compostable waste material so as to provide a compostable balance of nitrogen and carbon content.

45. The method of claim 42 wherein the nitrogen and carbon content have a ratio of about 2:1 to about 100:1.

46. The method of claim 42 wherein the nitrogen and carbon content have a ratio of about 25:1.

47. The method of claim 42 wherein the vermiculture bioreactor is selected from a bin vermicomposter, a rotating drum vermicomposter, windrows and combinations of these.

48. The method of claim 42 wherein the drilling fluid further includes a weighting agent.

49. The method of claim 42 wherein the drilling fluid further includes a fluid loss control agent.

50. The method of claim 42 wherein the non-oleaginous fluid is selected from fresh water, sea water, a brine containing organic or inorganic dissolved salts, a liquid containing water-miscible organic compounds, and combinations thereof.

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51. The method of claim 42 wherein the emulsifying agent is a curisic diglyceride.

52. A vermiculture feed composition comprising: oil contaminated solids, a bulking agent, and a compostable nitrogen source.

53. The vermiculture feed composition of claim 52 wherein the oil contaminated solids are selected from drill cuttings, drilling mud, oil contaminated soil, and combinations thereof.

54. The vermiculture feed composition of claim 52 wherein the bulking agent is selected from sawdust, wood shavings, rice hulls, canola husks, shredded newsprint/paper; shredded coconut hulls, cotton seed hulls, and mixtures of these.

55. The vermiculture feed composition of claim 52 wherein the compostable nitrogen source is selected from yard wastes, household wastes, farm wastes, food preparation wastes, food processing wastes, paunch material, rumen material, animal rendering wastes, sewage sludge, and mixtures of these.

56. The vermiculture feed compositions of claim 52 wherein the compositions have a carbon to nitrogen ratio of about 25:1 and a moisture content of about 75% by weight.

57. The vermiculture feed compositions of claim 52 wherein the composition further includes pretreated or pre-composted materials.

58. The vermiculture composition of claim 52 wherein the composition is pre-treated or pre-composed prior to being used in vermiculture.

59. A vermicast composition comprising vermicast and biodegraded drill cuttings.

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